

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1-17. (Canceled).

18. (Currently Amended) A method of controlling a system to optimize an objective function thereof, the system being capable of performing a plurality of candidate actions and being capable of monitoring response performances of a performance of a respective candidate action, the method comprising the steps of:

a) monitoring response performance of a respective candidate action that is chosen to be performed by the system;

b) storing, according to candidate action performed by the system, a representation of said monitored response performance;

c) choosing which of the plurality of candidate actions is next performed by the system so as to optimize said objective function by assessing, using the probability distribution of the response performance of all of said plurality of candidate actions, which candidate action is estimated to result in the lowest expected growth in regret after the chosen candidate action is performed by the system;

d) commanding the system to perform the candidate action identified to be the next performed in step c); and

e) repeating steps a) to e) d) to control the system so as to substantially optimize the objective function of the system;

where regret is a term that represents a system performance measure that considers the relative merit of exploration of one or more apparently non-best candidate actions, with respect to the relative merit of exploiting what appears to be the current best candidate action based on historical response performances to date.

19. (Previously presented) A method according to claim 18 wherein step c) includes assessing which candidate action is likely to result in the lowest expected growth in regret on the basis of a true best candidate action which has the mean of said probability distribution.

20. (Previously presented) A method according to claim 18 wherein step c) includes evaluating the cost or losses associated with presenting a lower performing candidate action and the gain or benefit associated with knowing the true position of the current best observed candidate action on said probability distribution.

21. (Previously presented) A method according to claim 20 wherein step c) includes assessing which candidate action is likely to result in the lowest expected growth in regret according to an assumption that the current best observed candidate action is assumed to have zero uncertainty around its mean or expected response performance.

22. (Previously presented) A method according to claim 18 wherein step c) includes assessing which candidate action is likely to result in the lowest expected growth in regret according to an assumption of a Student's distribution and evaluation of Student's t parameters as the basis for estimating probabilities of unequal or equal response states between the candidate action with the current expected best response performance and any other candidate action.

23. (Currently Amended) A method according to claim 18 wherein step c) includes using a Monte Carlo algorithm to provide understanding of the probability distribution of the response performance of all of the plurality of candidate actions and either choosing the candidate action that if not taken would contribute[s] most to an expected regret estimate, or choosing a candidate action with probability proportional to its contribution to the expected regret estimate if not taken.

24. (Currently Amended) A method according to claim 18 further comprising the step of:

⇒ f) applying a temporal depreciation factor to the stored representations of the response performance in order to depreciate the significance of the stored representations over time.

25. (Currently Amended) A method according to claim 24 wherein step e) f) includes applying, for each candidate action, a different temporal depreciation factor to the stored representations of the response performance thereof.

26. (Currently Amended) A method according to claim 18 further comprising the step of:

e) f) forcing the performance of each candidate action a minimum number of times or at a minimum rate.

27. (Previously presented) A method of controlling a system according to claim 18 wherein the system comprises a robot.

28. (Currently Amended) A method of controlling a system having two or more ranks of control arranged in a hierarchy, wherein each rank of control has a respective objective function and is capable of performing a plurality of candidate actions for that rank of control in the hierarchy, wherein the candidate action of a rank of control at the lowest level in the hierarchy represents the output candidate action selected to be performed by the system, and wherein the candidate action of a ~~can represent a lower~~ rank of control not at the lowest level in the hierarchy represents the selection of a lower rank of control in the hierarchy, and wherein the method by which each individual ~~comprising controlling said~~ rank of control operates is performed according to the method of claim 18.

29. (Currently Amended) A method according to claim 28 wherein representations of ~~said~~ the monitored response performances of the lowest level ranks of control are all visible and accessible to the rank of control immediately above in the hierarchy, for the purposes of appraising the probability distribution of the response performance of all of said plurality of candidate actions ~~stored in step b) are shared with said rank of control.~~

30. (Previously presented) A method according to claim 18 wherein the monitored response performance of a respective candidate action in step a) is stored in step b)

in a form to enable sharing of the stored representation of said monitored response performance with another system.

31. (Currently Amended) A system having a control apparatus that is programmed to control the objective function of the system ~~controlled~~ according to the method of claim 18.

32. (Currently Amended) A ~~robot controlled~~ system according to ~~the method of claim 18~~ 31, where the system comprises a robot.

33. (Currently Amended) A control apparatus ~~operating according to the method of claim 18 to control~~ for controlling a system to optimize an objective function thereof, the system being capable of performing a plurality of candidate actions and being capable of monitoring response performances of a performance of a respective candidate action, the control apparatus programmed to perform the steps of:

a) monitoring response performance of a respective candidate action that is chosen to be performed by the system;

b) storing, according to candidate action performed by the system, a representation of said monitored response performance;

c) choosing which of the plurality of candidate actions is next performed by the system so as to optimize said objective function by assessing, using the probability distribution of the response performance of all of said plurality of candidate actions, which candidate action is estimated to result in the lowest expected growth in regret after the chosen candidate action is performed by the system;

d) commanding the system to perform the candidate action identified to be the next performed in step c); and

e) repeating steps a) to d) to control the system so as to substantially optimize the objective function of the system;

where regret is a term that represents a system performance measure that considers the relative merit of exploration of one or more apparently non-best candidate actions, with

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respect to the relative merit of exploiting what appears to be the current best candidate action based on historical response performances to date.

34. (New) A method according to claim 18 wherein the representation of said monitored response performance contains at least one variable that characterizes the conditions under which the candidate action was performed.